Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

CHEMISTRY.

No. I.

PURIFICATION OF GOLD.

The Sum of TWENTY GUINEAS *was presented to Mr.* LEWIS THOMPSON, *for the following communication on his Method of Purifying Gold.*

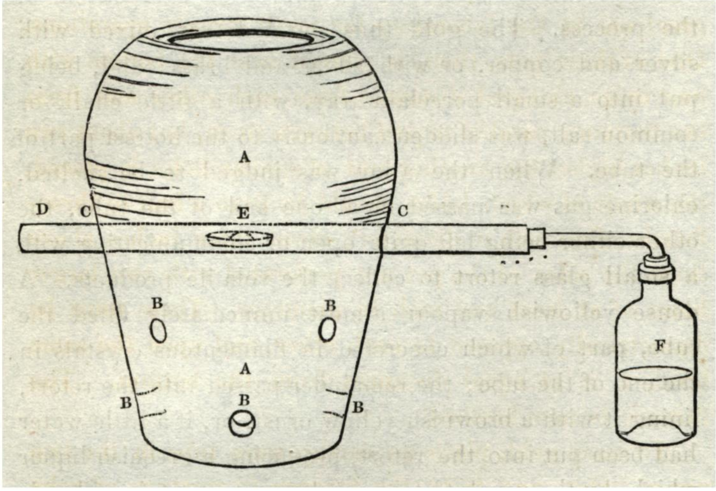
GENTLEMEN,

IN the common mode of assaying gold, the alloy to be assayed is subjected to two operations, cupellation and parting, each of which requires great care and skill; so much so indeed that success seems rather to be the effect of a particular tact on the part of the assayer than the result of a well-defined chemical process. The plan which I now propose for assaying and purifying gold is no less simple in execution than certain in effect, and is founded upon a circumstance long known to chemists, viz.:—that not only has gold no affinity for chlorine at a red heat, but that it actually parts with it at that temperature, although previously combined; that is to say, the chloride of gold is reduced to the metallic state by heat alone, it cannot, therefore, possess any affinity for chlorine when red hot: this, however, is not the case with those metals with which gold is usually alloyed, it offers, therefore, at once an easy and certain means of separation. The application of these facts is all, therefore, to which I can lay claim, as the facts themselves have been known for many years, and the reason why they have not been so applied is, that hitherto chemists have not directed their attention to this art, but have left it entirely in the hands of the assayers, who are, for the most part, ignorant of chemistry. The process here proposed has been abundantly tested by myself and others, and employed by those wholly unacquainted with chemistry, as well as by men of eminence in that science, with equal success. There is, indeed, but one source of failure, and this arises from the intense action of chlorine upon the baser metals when melted, by which portions of the alloy are spirted up or projected from the cupel, as happens in the common mode of assaying silver when the heat is too great. This inconvenience is to be avoided in two ways. Firstly, by allowing the chlorine to be evolved slowly at the commencement of the operation, by which the intensity of the action at first is diminished, until the relative proportion of gold in the alloy is increased; or, secondly, by passing the chlorine over the alloy in powder, or laminated into a thin plate at a dull red heat for a few minutes, and then raising the temperature so as to melt it when the fumes of the metallic chlorides have visibly diminished. In conclusion, I can only add, that a very little practice will enable any one in possession of a good balance to make assays of gold with the greatest accuracy. In a course of experiments, conducted at Guy's Hospital, in the presence of Mr. A. Aikin and other scientific gentlemen, a piece of gold was twice alloyed, and then purified by chlorine, without any sensible loss when weighed in a balance which readily turned with the $\frac{1}{100}$th of a grain.

The furnace which I employ for the process is made out of one of those pots employed for melting steel, and which cost about 1*s.* 6*d.* each. They are from 14 to 16 inches in height, and consist principally of Stourbridge clay and coke. Their form is rather peculiar, as the upper part is contracted so as to form a kind of dome, as in the figure. They are so soft as to be easily cut with a knife: and I have been thus far particular in describing them because the practical chemist will find them of great use in the laboratory for small furnace operations. One of these pots, then, is pierced near the bottom with four holes, at equal distances from each other and from the bottom; parallel to and between them, but about two inches higher up, another row of similar holes is placed, the whole of which holes should be from a half to three-fourths of an inch in diameter; about three inches above these the sides of the pot are perforated with two larger holes of at least one inch in diameter. These must be diametrically opposed to each other, and upon the same level, *i. e.* at equal distances from the bottom. The furnace is now finished.

To assay gold, place an earthenware tube in the two upper holes, and light the furnace (a mixture of coke and charcoal answers best, though coke alone will do); when the tube is seen to be white hot, place in it the alloy contained in a little cupel made of bone-ash, and push it along to the centre of the furnace by means of a wire, then connect one end of the tube with a bottle in which chlorine is forming from a mixture of peroxide of manganese and muriatic acid; the chlorine will, consequently, pass along the heated tube and over the melted alloy, with the silver, copper, &c. of which it will combine and leave the gold pure and untouched. During the process dense fumes may be observed to fill the tube, and when these are no longer produced the process is finished; the cupel may now be withdrawn, and the gold removed and weighed.

I am, Gentlemen, &c. &c.
To the President, &c. LEWIS THOMPSON.
of the Society of Arts, &c.



Description.

A A, steel pot.
B B B, holes for the admission of air.
C C, holes for the admission of the tube.
D D, the tube placed horizontally in the furnace, containing
E, the cupel and gold.
F, the bottle in which chlorine is generated.

Report of Arthur Aikin, Esq. F.L.S. &c.

The experiments above alluded to as having been made in my laboratory, were conducted by Mr. Thompson himself under my inspection. The gold was obtained from an assayer, and was stated to be perfectly pure; but in many instances, on being subjected at a melting heat to the action of chlorine gas, a very small diminution of weight was observed, occasioned, no doubt, by the volatilisation of a little alloy, for the button of gold underwent no further diminution whatever on a repetition of the process. The gold thus purified was mixed with silver and copper, or with silver and brass; and, being put into a small porcelain tray, with a little chalk or common salt, was slidden cautiously to the hottest part of the tube. When the alloy was judged to be melted, chlorine gas was passed in at one end of the tube, the other either being left quite open or communicating with a small glass retort to collect the volatile products. A dense yellowish vapour almost immediately filled the tube, part of which concreted in filamentous crystals in the end of the tube; the remainder passed into the retort, lining it with a brownish yellow crust, or, if a little water had been put into the retort, producing a greenish liquor which, by the usual tests, was shewn to contain chlorids of copper, zinc, and iron. The latter was, no doubt, derived from the ferruginous clay of which the tube was made, for the inside of it, after the process, was found to be nearly white.

On examining the contents of the tray, after the production of vapour had ceased, the button of gold was found imbedded in a melted mass of chlorid of sodium (or chlorid of calcium, if chalk had been put into the tray) mixed with chlorid of silver, the presence of alkaline chlorid seeming to have the property of preventing the volatilisation of chlorid of silver.

In all the first trials, the button of gold was found to weigh considerably less than before the process, and the accidental breaking of one of the tubes shewed that in the part directly over the tray several globules of gold adhered, having probably been thrown up thither by the ebullition of the alloy when the chlorine was first passed over it. Having thus discovered the cause of the failure, the process was twice more repeated, taking care to give only a low red heat in the beginning, and to pass the chlorine slowly. With these precautions, the button of gold, remaining at the end of the process, was found to be exactly equal to its original weight as shewn by a balance that indicated well to the $\frac{1}{200}$th part of a grain.

7 *Bloomsbury Square.* A. AIKIN.

No. II.

GALVANIC BATTERY.

The GOLD ISIS MEDAL was presented to Mr. ALFRED SMEE, Surgeon, Bank of England, for the following Communication on a Galvanic Battery of a new Construction; a Model of which has been placed in the Society's Repository.

THE most valuable instrument which chemists employ for their analytical experiments is, no doubt, the galvanic